



**Center for Energy and Environmental Policy Research**

**Unraveling the Chinese Oil Puzzle**

by  
**R.S. Eckaus**

**04-022 WP**

**December 2004**

**A Joint Center of the Department of Economics, Laboratory for Energy  
and the Environment, and Sloan School of Management**

## Unraveling the Chinese Oil Puzzle

I. Introduction

As oil prices rose in 2004, a large part of the blame was laid at the feet of the emerging colossus of the East. Newspaper stories wrote of the, “surging,” and, “insatiable demand,” coming from China, describing it as the, “engine of oil demand growth,”<sup>1</sup> and explaining the change, “More than a billion Chinese are joining the oil market.... How can prices go down?”<sup>2</sup> There were moderately dissenting voices, e.g., from a professional at the International Energy Agency, “It is neither fair nor accurate to blame China for most of the rise in oil prices.”<sup>3</sup>

The measured increases in China’s international oil imports are based on international data and are quite real and not related to the probable overestimates of China’s overall rate of economic expansion. The very high growth rates of Chinese oil imports in 2004 and previous years are shown in Table 1. The implied growth rates are so high as to be almost unbelievable. From the fourth quarter of 2003 to the third quarter of 2004, there was a 30 per cent increase in crude oil imports. Such a high growth rate is not the way economies, in general, actually behave or, in particular, the manner in which the Chinese economy has functioned in the past, even in the course of its remarkable expansion. Yet the growth is real, so how can it be explained? That is the puzzle!

---

<sup>1</sup> Klaus Rehaag, (Head, Oil Industry & Markets Division, International Energy Agency, Paris, France), “Nailing Jelly To a Tree,” USB Workshop, Hong Kong, 22-23 September, 2004.

<sup>2</sup> Quoted in Time Asia, <http://www.time.com/time/asia/magazine/article/0,13673,501041025-725174,00.html>.

<sup>3</sup> Quoted in Time Asia, <http://www.time.com/time/asia/magazine/article/0,13673,501041025-725174,00.html>.

## II. Unraveling the puzzle

Table 1 also provides the first hint as to how to unravel the puzzle. Crude oil imports have grown at extraordinary rates. While extensive new storage facilities are being constructed in China, they are not as yet adequate to contain even a substantial portion of those increased imports, which must have been feedstock for refinery production of products. Now notice that the fastest rate of increase in the products and feedstock group has been in gasoil/diesel and heavy fuel oil which are, to some extent, substitutable. By comparison, as shown in the table, gasoline imports actually declined.

Table 1<sup>4</sup>  
China Crude & Product Trade  
(thousand barrels per day)

Net Imports/(Exports) of:	2002	2003	4Q03	1Q04	2Q04	3Q04	4-Jul	Aug 04	Sept-04	Latest Month (Sept., '04)vs	
										Aug -04	Sept.-03
Crude Oil	1247	1664	1716	2290	2371	2232	2185	2106	2413	307	202
Products & Feedstock	361	442	445	600	849	544	621	429	582	153	14
Gasoil/Diesel	-16	-28	-9	22	50	21	29	2	32	30	86
Gasoline	-142	-175	-151	-95	-141	-146	-122	-178	-138	40	77
Heavy Fuel Oil	281	407	361	448	653	412	446	424	364	-60	-183
LPG	197	202	203	172	227	222	249	164	255	90	44
Naphtha	-16	-22	-24	-21	-11	-48	-39	-57	-48	8	-19
Jet & Kerosene	9	1	-6	21	15	19	2	5	53	48	17
Other	48	58	70	54	56	63	56	69	64	-5	-8
Total	1609	2106	2161	2890	3220	2776	2806	2535	2994	460	216

Table 2 adds information about domestic production. The highest rate of growth has been in the production of diesel fuel. But what lies behind the growth in diesel and fuel oil imports? It is unlikely to be the increase in the output of China's oil fired electricity generating plants. Those plants account for only 3.5 per cent of China's electric power capacity

<sup>4</sup> International Energy Agency, Monthly Oil Report, 10 November, 2004, p. 14.

Table 2  
Fossil fuel production, 2994

Item	Unit	Jan.- Sept.,2004	Sept.,20 04	Growth over 2003 (per cent)	
				Jan.-- Sept.	Sept.
Coal	10 '000 tons	114339.4	13406.0	15.8	20.4
Crude oil	1000 barrels	3218.4	362.5	3.0	5.7
Refined crude oil	1000 barrels	4986.5	556.1	15.4	7.3
Gasoline	1000 barrels	1130.1	432.7	11.6	5.5
Kerosene	1000 barrels	185.0	86.6	14.4	7.0
Diesel fuel	1000 barrels	1869.3	842.9	20.3	15.5
Lubricating oil	1000 barrels	84.1	7.5	17.1	-2.4
Fuel oil	1000 barrels	376.7	36.2	11.1	0.2
Natural-gas	100 million cubic metres	294.0	32.4	17.6	18.1

and that capacity must have been nearly fully utilized in the currently reported overall electric power shortage. Oil fired generating capacity has, moreover, been expanding slowly, if at all, as nearly all new capacity has been in coal fired plants. Nor have the diesel oil and fuel oil imports been replacing domestic production. As shown in Table 2, domestic production increased by 20.3 per cent from January to September. It is possible that some electric power plants can switch from coal to oil and that this type of substitution is responsible for some of the increase in fuel and diesel oil imports. It is also possible that some of the imports have gone into storage. Yet, while China is building oil storage capacity, relatively little of that seems to have come on line this year.

Tables 1 and 2 indicate that the large increases in crude imports were not, as commonly assumed, mainly to increase domestic production of gasoline. Such production increased at only slightly more than half the rate of increase in domestic diesel production. This indicates that the

rapid growth in the automobile fleet in China, which has received a lot of attention, is not the cause of the overall high growth rate of Chinese oil imports.

The first piece of the puzzle is the widely reported shortage of electric power. Some of the published numbers do not confirm this, but the, “anecdotal,” comments are overwhelming. Official data indicate a roughly 15 per cent increase in electricity production in 2004, through November.<sup>5</sup> If overall GDP continued its 9 per cent growth of 2003 in 2004, that would indicate an electricity production/GDP elasticity of 1.67, which would be substantially higher than in recent years and would suggest that there is no overall electric power shortage. In spite of these numbers, the People’s Daily wrote, “In the coming third quarter this year, the country will be short of around 30 million kw of electricity, said sources with the China Electricity Council.”<sup>6</sup> This Council, an official body, has issued other statements confirming the shortage mainly in the eastern and southern provinces.<sup>7</sup>

There is other evidence which is more than, “anecdotal,” and which is overwhelming. There have been frequent announcements of electric power rationing to entire cities as well as to individual manufacturing plants and shops. There have also been with frequent, often unannounced outages, with the greatest shortages apparently in South China. For example, in December of last year the China Daily wrote, “Residents of southern Chinese city of Changsha spend one day of every four without power. Coal is growing scarcer.”<sup>8</sup> Perhaps the official estimates of electric power production are wrong.

---

<sup>5</sup> All China Marketing Research Co.,Ltd.

<sup>6</sup> “China speeds up grid construction to ease severe power shortage,” People’s Daily, June 7,2004.

<sup>7</sup> People’s Daily Online, February 25, 2004.

<sup>8</sup> “Power Shortages Darken Southern China,” China Daily, December 14,2003..

There are several possible reasons for what appears to have been a shortage of centrally generated electric power. First, coal production to fire the generating stations may have not been adequate for the high level of usage, as suggested by the quotation above. Again, however, the official statistics report a 16 per cent increase in coal production through September. Second, there have been reports of bottlenecks in the rail transport necessary to bring coal to the generating stations. Third, there seems also to have been inadequate generating capacity. Fourth, there have been many complaints of inadequate transmission line capacity. And, fifth, the artificially low oil and electricity prices have done little to restrain demand. With the data currently available, it is not possible to allocate the blame between these five constraints. It is possible that accurate estimates of generating capacity are not available even to the central electric power authorities. There are complaints that, “unauthorized,” generating plants have been constructed with provincial or even local support or tolerance. Accurate estimates of their total capacity may not even exist. Likewise the electric power grids are, to some extent, localized and not capable of transmitting power from possible excess areas to the areas with deficits in supply.

While the reasons remain cloudy, the power shortages must be counted as real and as a significant economic mistake. Did the central and provincial authorities simply underestimate the growth in demand at the prevailing prices? Were the consequences of having power rates that were often subsidized taken into account? Or were the mistakes all on the supply side, in providing coal and rail transport capacity and/or generating and transmission line capacity? Were there overoptimistic expectations of the expansion of privately financed power stations?

The second piece of the puzzle is in the sharply increased production and use of small diesel/electric generators. The increased gasoil/diesel and fuel oil imports seem almost certainly to have fueled these generators that have been installed quite widely to provide electric power

that could not be obtained from the electricity grids and power plants. There is abundant anecdotal and partial statistical evidence for this.<sup>9</sup> The quotation just above goes on to state, “Electric heaters have been banned and sales of generators have quadrupled.” There are statements such as, “During dark days, scores of the boxy, roaring contraptions are set out on the sidewalks in front of small shops.”<sup>10</sup> And Mitsubishi Heavy Industries reported, “The plant has also seen growth in orders for its generator sets, due to the shortage of electricity supply in China.”<sup>11</sup> The last phrase in the quotation bears out the previous explanation. There have even been recent suspensions of local limits on noise and emissions, because of the need for these small scale sources of electric power.<sup>12</sup>

According to Chinese data, the production of, “electric power generating equipment,” rose by 102 per cent from January to September of this year, as compared to the same period last year. Electric power output in the same annual comparison rose by 14.5 per cent. So the electric power generating equipment was almost certainly not large turbine generators, but rather the smaller generators. The production of internal combustion engines rose by 22 per cent. While this reason for the increased fuel oil demand has been noted before, it has also seldom been acknowledged, even in the International Energy Agency.

---

<sup>9</sup> The comparable experience in India is also instructive.

<sup>10</sup> China Daily, Dec. 14, 2003.

<sup>11</sup> [http://www.americasgenerators.com/gensetblog/2004\\_07.html](http://www.americasgenerators.com/gensetblog/2004_07.html)

<sup>12</sup> A simple calculation supports the explanation. A small 20 kw diesel electric generator running 16 hours per day for 300 days per year and consuming 1 gallon of fuel per hour would use 228.48 barrels of fuel per year. So 5000 of these sets would use 1,252,000 barrels. This number is in the range of imports and domestic production of diesel fuel, taking into account that many diesel sets, helping to power factories were much larger, although they were probably not used for 16 hours on most producing days, substituting for centrally provided electricity. Internal combustion engines capable of generating 320,855 kw were produced in China from January to September, 2004.

### III. Consequences

Some of the effects of the missteps are obvious: disruptions in domestic electric power production and consumption, higher prices for the fuel and diesel oil imports and a diversion of manufacturing production to the small diesel/electric generators. In addition, these small generators have the not inconsiderable disadvantages of being heavily polluting, as well as noisy and inefficient..

There is, however, a bright spot in the story. The large scale recourse to small diesel/electric generators to maintain the activities of manufacturing plants and individual shops is testimony to the ingenuity and enterprise of their owners.

As for the future of oil imports in China, in the near term it is expected that electricity production and deliveries will grow and there has already been some cutback in approvals for new generating stations, while transmission line construction and connection proceeds rapidly. These developments should decrease the demand for foreign oil. On the other hand, as noted, there has been a rapid increase in the construction of oil storage facilities. While it might be expected that Chinese authorities will fill those facilities at a measured pace that will not push the price against them by too much, they have also shown signs of deep concern for ensuring their future supplies. The growth in the automobile fleet and other oil uses can be expected to outpace the overall economic growth rate by some percentage points. Still, it seems plausible that the growth in China's foreign oil demands will return to a pace only slightly higher than that of 2002 and 2003.<sup>13</sup>

---

<sup>13</sup> The Wall Street Journal of Dec. 22, 2004 (p. A11) quotes a recent Merrill Lynch report as follows: "We have not found any clear signs of weakening in China's oil demand after three quarters of macro tightening." However, "macro tightening," is not the most effective way of reducing the rate of growth of China's oil demand. That will depend on the rate at which electric power supply can be expanded.